

DEPARTMENT OF HEALTH
RADIOACTIVE AIR EMISSIONS
LICENSE AMENDMENT FOR

**PROJECT TITLE: MAGNESIUM HYDROXIDE PRECIPITATION PROCESS AT THE
PLUTONIUM FINISHING PLANT**

Date Approved: 08-Nov-01

Emission Unit Name: 291-Z-1

This is a MAJOR, ACTIVELY ventilated emission unit.

This emission unit requires the following Abatement Technology:

Applicable Requirements: ALARACT

ALARACT [WAC 246-247-040(4)]

BARCT [WAC 246-247-040(3)]

Zone or Area:	Abatement Technology	Required # of Units	Additional Description/Conditions
(234-5Z Operations)	HEPA	2	2 Stages for process operations
236-Z Operations)	HEPA	2	2 Stages for process operations
(242-Z Operations)	HEPA	2	2 Stages for process operations
(all operations)	Fan	4	3 standby (7 total)

Additional abatement technologies required by this Notice of Construction will be listed in the Conditions and Limitations section.

This emission unit has the following Monitoring and Sampling Requirements:

Applicable Requirements: Monitoring, Testing and Quality Assurance WAC 246-247-075

Regulatory Requirements	Monitoring and Testing Procedure	Radionuclides Requiring Measurement	Sampling Frequency
40 CFR 61.93(b)(4) & WAC 246-247-75(2)	Alternative effluent flow rate not to exceed 290,000 cfm. Method 114 appendix B 61.93(b)(2)(ii) ANSI N13.1	All radionuclides which could contribute 10% of the potential EDE.	Continuous

Sampling Requirements: Continuous

Additional monitoring or sampling requirements established by this NOC will be listed in the Conditions and Limitations section.

Change History

- 10/31/01 NOC Revision Form, DOE/RL-99-77, Rev. 0G, approved October 31, 2001 provided process description changes. Approval letter, AIR 01-1102, mailed on November 08, 2001.
- 07/25/01 NOC Revision Form, DOE/RL-99-77, Rev. 0F, approved July 25, 2001 provided condition changes. Approval letter, AIR 01-802, mailed on August 15, 2001.
- 07/11/01 AIR 01-702 mailed July 11, 2001 to incorporate revision forms approved on March 6, 2001, May 3, 2001, and June 19, 2001.
- 06/19/01 NOC Revision Form submitted via RTAM, approved on June 19, 2001 to provide process description change.
- 05/03/01 NOC Revision Form submitted via RTAM, approved on May 3, 2001 to provide a minor description change.

- 03/06/01 NOC Revision Form approved on March 6, 2001 during RTAM to provide a minor description change and a clarification.
- 02/02/01 NOC ID 442 combined into NOC ID 443.
- 11/07/00 Incorporation of supplemental information for ventilation system, approved via AIR 00-1017 dated November 7, 2000.
- 09/29/00 NOC Revision Form approved on September 29, 2000 during RTAM to provide a minor description change.
- 09/09/00 NOC Revision Form approved on September 9, 2000 during RTAM to provide a minor description change.
- 08/25/00 Conditions and Limitations of AIR 00-402 were voided and replaced by AIR 00-801, August 25, 2000.
- 04/06/00 Conditions and Limitations of AIR 00-313 were voided by AIR 00-402, April 6, 2000.
- 03/23/00 Revised NOC was approved via AIR 00-313 on March 23, 2000.

CONDITIONS AND LIMITATIONS

- 1) The U.S. Department of Energy shall comply with all Conditions and Limitations of this license (WAC 246-247-060(5)).
- 2) The total abated emission limit for this Notice of Construction is limited to $1.10\text{E}-01$ mrem/year to the Maximally Exposed Individual. The total unabated emission limit for this Notice of Construction is limited to $2.20\text{E}+02$ mrem/year to the Maximally Exposed Individual.
- 3) **This process is limited to:**
processing, stabilizing, and packaging, for interim storage, liquid nitrate solution. Stabilization of the solution shall be accomplished by the combination of a magnesium hydroxide and/or oxalate precipitation process and the existing muffle furnaces.

The magnesium hydroxide and/or oxalate precipitation process shall remove, by precipitation, plutonium contained in various nitric solutions. The nitric acid solutions shall be reacted by the addition of magnesium hydroxide and/or oxalic acid. A weak nitric acid stream shall dilute the existing solutions as necessary to optimize the plutonium recovery and generate feed solutions with an acid strength of approximately 3.0 Molar. The feed preparation activities will be performed in existing PFP facilities. The acid strength of the plutonium nitrate feed solutions, including those that do not require dilution will range from 0.3 Molar to 5.0 Molar.

The diluted solution shall be fed to three precipitation vessels where the magnesium hydroxide powder and/or oxalate acid will be added manually. The vessels shall be agitated, after magnesium hydroxide and/or oxalate acid addition, by sparging air up through the vessels by pulling a vacuum on the precipitation vessels.

After the reaction is complete, the precipitators shall be drained by gravity to an open pan filter where the plutonium solids are collected. The filtrate will be vacuumed into a phase separator for collection. The filtrate will be filtered further in the polishing filters before being pumped to temporary storage in the filtrate tanks. Filtrate with less than 3 grams per liter of plutonium will be disposed using existing PFP facilities. Out-of-specification material would be subject to recycle for plutonium recovery.

Plutonium solids will be transferred to an open metal container and heated on a hot plate to further dry the material within the glovebox. The plutonium will be cooled before being conveyed to the muffle

furnaces. Dried plutonium solids may be placed in storage before subjecting to muffle furnace thermal stabilization. The dried solids would be placed manually into appropriate storage containers (e.g., poly jars or other similar sized closed containers) and transferred to existing gloveboxes (i.e., HA-23S or HA-20MB) for potential interim storage. These gloveboxes will tie into the existing ventilation system exhausting through the 291-Z-1 stack.

At a later date, the containers may be retrieved from storage and returned to the precipitation glovebox for final stabilization. The materials then will be transferred into the vessels used for thermal stabilization (i.e., boats). The boats will be transferred to the muffle furnaces for final stabilization. The existing muffle furnaces shall be used to convert the dried plutonium hydroxide to plutonium powder.

Select solutions may be designated as waste. The equipment and enclosures for direct discard of waste plutonium solutions will be used in Room 185 of the 234-5Z building. Unique containers holding the dilute plutonium solutions will be brought from their storage location and analyzed for plutonium content using non-destructive analysis (NDA) equipment before bringing the containers into Room 185. The equipment in Room 185 will include a large tent to envelope plastic enclosures. The enclosures will be vented to the 234-5Z E3 ventilation system by connecting a vent hose from each plastic enclosure through a high-efficiency particulate air (HEPA)-type filter through a HEPA-type filtered vacuum cleaner that is exhausted to the existing E3 ventilation system. Airflow is provided through each plastic enclosure through HEPA-type filters. A large containment tent will be installed to enclose the plastic enclosure operation and provide occupational protection. The vacuum cleaner would maintain a negative pressure inside the enclosures with respect to the large tent. A blower connected to the tent would maintain a negative pressure inside the tent with respect to Room 185.

After pumping has been completed, the pump is turned off, and the transfer system appropriately isolated (e.g., the tubing could be cut just above each drum, and the tubing ends sealed; the drum lids would be bolted into place). In some cases, transferring the solution from two product containers into one receiving drum will be done. After pumping operations, the receiving drum is to be transferred to a storage area. The empty product containers are to be transferred for drum disposition (i.e., storage, reuse and/or discard). Each drum moved out of Room 185 will be analyzed for plutonium content using NDA equipment.

Direct discard also could be conducted in Room 227 in the 234-5Z Building. The process in Room 227 will be the same as that described in Room 185. Solution transfers would be conducted such that radiological contamination would be directed through the 227-T hood exhaust, which is routed to the atmosphere through the existing E-4 ventilation system (room air in Room 227 exhausts through the E-3 ventilation system).

- 4) These Conditions and Limitations must be proceduralized prior to starting the activities described in the Notice of Construction.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 5) This approval, with its Conditions and Limitations must be included in the next revision of the Hanford Air Operating Permit (WAC 246-247-060(1)(e) and (2)(c)), and will at that time, constitute a revision of the Radioactive Air Emissions License.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 6) If the department finds that the emission unit described in this NOC is not in compliance with the standards in WAC 246-247-040 during construction (as described in the NOC or during operation) the department reserves the right to require modifications to bring it into compliance (WAC 246-247-

060(2)(d)).

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 7) The facility shall notify the department at least seven days prior to any planned preoperational testing of the emission unit's emission control, monitoring or containment systems. The department reserves the right to observe such tests (WAC 246-247-060(4)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 8) The department reserves the right to conduct its own stack sampling, environmental monitoring or other testing, as required around this unit to assure compliance. If the department so decides, the facility must make provision for such testing (WAC 246-247-075(10)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 9) The facility must be able to demonstrate that the workers associated with this emission unit are adequately trained in the use and maintenance of emission control and monitoring systems, and in the performance of associated test and emergency response procedures (WAC 246-247-075(12)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 10) The facility must be able to demonstrate the reliability and accuracy of emission data and other test results from this unit (WAC 246-247-075(13) and WAC 246-247-075(6)). The facility must be able to demonstrate that it has a quality assurance program compatible with applicable national standards listed in, or equivalent to, those listed in the above-cited regulation.
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 11) The department reserves the right to inspect and audit this unit during construction and operation. This includes all activities, equipment, operation procedures, documents, data, and other records related to compliance with the regulations (WAC 246-247-080(1)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 12) The department may require an ALARACT demonstration at any time (WAC 246-247-080(1)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 13) All reports and records must be kept and reported according to 40 CFR 61, Subpart H (WAC 246-247-080(2)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 14) Records must be readily (promptly) available for this unit. Those records must be maintained onsite, and must be retained for at least five years (WAC 246-247-080(8)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 15) All measured or calculated emissions must be reported annually (WAC 246-247-080(3)).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 16) If there is an unexpected release of radioactivity or if there is a shutdown or other condition that, if it were allowed to persist, would result in emissions of radionuclides in excess of any Conditions or Limitations in the NOC or that lasts more than four hours, it must be reported to the department within 24 hours. Applicable standards (WAC 246-247-040) include unit specific emission limits (paragraph 5), the offsite dose standard (paragraph 1), BARCT (paragraph 3) or ALARACT (paragraph 4), whichever is applicable, or any limitations included in this approval (paragraph 5).
Conditions and Limitations added by AIR 00-801, August 25, 2000.
- 17) This unit must be fully accessible to Department of Health (DOH) inspectors. If there are any specific training requirements or have restrictions or special requirements for entry, they must be given to the department when they are known to allow for unannounced inspections, as required by EPA (WAC 246-247-080(9)). At a minimum, for unannounced inspections, such requirements or restrictions must be told to inspectors that morning, with the opportunity for the inspectors to meet those requirements. For

prior announced inspections, such notification must occur far enough in advance for the inspectors to have reasonable time to meet the requirements.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 8) The facility shall make requested documents available for timely manner for review (WAC 246-247-080(10)).

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 19) When this project is completed, or operations cease, the facility shall notify the department via a report of closure, and indicate whether or not any potential for airborne release occurred (WAC 246-247-080(6)).

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 20) **This condition was obsoleted on 07/25/2001.** The work approved in this NOC is limited to those described activities associated with the construction and operation activities involving the magnesium hydroxide precipitation process of plutonium solutions in nitric acid solutions within the Plutonium Finishing Plant (PFP).

Conditions and Limitations added by AIR 00-801, August 25, 2000. Condition obsoleted by NOC revision forms dated May 3, 2001, June 19, 2001 and July 25, 2001.

- 21) **This condition was obsoleted on 07/25/2001.** Approved activities included in the process are the following: Stabilization by precipitation and use of the muffle furnaces; drying of the precipitated plutonium oxide (PuO₂); packaging of the dried PuO₂ for interim storage and disposal of the filtrate from the liquid nitrate solution using existing PFP processes.

Conditions and Limitations added by AIR 00-801, August 25, 2000. Condition obsoleted by NOC revision forms dated June 19, 2001 and July 25, 2001.

- 22) **This condition was obsoleted on 07/25/2001.** The concentration of the nitric acid make up feed solution used in the magnesium hydroxide process cannot exceed 3.0 Molar.

Conditions and Limitations added by AIR 00-801, August 25, 2000. Condition obsoleted by NOC revision form dated September 29, 2000.

- 23) The concentration of the nitric acid diluting solution used in the magnesium hydroxide process will average 0.35 Molar and be maintained within the safe operating parameters established for the process.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 24) All operating Conditions and Limitations imposed by DOH in letter # AIR 96-1205, dated December 18, 1996, or stated in the Notice of Construction for the Muffle Furnaces must be observed.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 25) **This condition was obsoleted on 07/25/2001.** Construction activities in Room 227 are limited to the installation of wall and ceiling mounts that will stabilize the glovebox during seismic activities. Decontamination activities in Room 227 must be less than 0.1 mrem/yr.

* The HEPA filtered vacuums used for decontamination activities in Room 227 must be approved in the list included in the Radioactive Air Emissions Notice of Construction for HEPA Filtered Vacuum Radioactive Air Emissions Units DOE-RL-97-50. This document is to be used as a guide for the use of HEPA filtered vacuum, prior to the time the room is connected to the ventilation system. All records must be maintained as required in the HEPA Filtered Vacuum Radioactive Air Emissions Units (DOE-RL-97-50) NOC.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

Condition obsoleted July 25, 2001, activity completed.

- 26) **This condition was obsoleted on 07/05/2001.** Construction activities in Room 230C are limited to the following:

- * Decontaminate and/or stabilize any contaminated areas as necessary.
- * Install two new gloveboxes to house the process equipment. These include precipitators, phase separator, polishing filters. Filtering tanks and hotplates.
- * Anchor the two new glove boxes to the floor.
- * Install wall and ceiling mounts, as necessary, to secure the gloveboxes in case of seismic activity.
- * Install drain lines from the new gloveboxes to a clean section of an existing drain line.
- * Connect the two new gloveboxes to the existing E-4 ventilation header.
- * Route feed returns and spare lines that originate in Room 227 to the new gloveboxes.
- * Install a new conveyor transport to connect to the new gloveboxes.
- * Cut a hole, with dimensions approximating a four foot diameter semicircle, into the wall between Rooms 230C and 230B to allow access to a glovebox port.
- * Remove and relocate the electrical power conditioner.
- * Relocate the current safety shower and eye wash station.
- * Install a new electrical control panel.
- * Install a wash water tank and run lines to two new gloveboxes.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

Condition obsoleted July 5, 2001, activity completed.

- 27) The maximum stack flow rate cannot exceed 137 cubic meters per second.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 28) Testing of all HEPA filters described in the NOC will be performed annually.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 29) The annual possession quantity for Plutonium (Pu) in nitric acid solutions cannot exceed 0.4 metric tons of Pu.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 30) **This condition was obsoleted on 07/25/2001.** The air in rooms 227 and 230C will exhaust through the E-3 High Efficiency Particulate Air (HEPA) ventilation system. The E-3 ventilation system contains one stage of HEPA filtration with a minimum efficiency of 99.95 percent for particles with a medium diameter of 0.3 microns, before connecting with the E-4 ventilation system and exhausting through the 291-Z-1 stack.

The offgases in Rooms 227 and 230C used in the work associated with the MHPP will exhaust through the E-4 ventilation system. The E-4 ventilation system has two stages of HEPA filtration with a minimum efficiency of 99.95 percent for particles with a medium diameter of 0.3 microns. The E-4 ventilation system then passes through two additional stages of HEPA filtration, before connecting with the E-3 ventilation system and exhausting through the 291-Z-1 stack.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 31) The monitoring system for the 291-Z-1 stack must remain compliant to all the NESHAPs requirements.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 32) The muffle furnaces must connect into the E-4 ventilation system and be configured as described in the Muffle Furnace Notice of Construction (DOE/RL-96-79).

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 33) The maximum furnace temperature must not exceed approximately 1,000 degrees C.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 34) All work on this project must be completed on or before October 1, 2010.

Conditions and Limitations added by AIR 00-801, August 25, 2000.

- 35) The work approved in this NOC is limited to those described activities associated with the construction and operation activities involving the magnesium hydroxide precipitation process, the oxalate precipitation process and the discard of plutonium in nitric acid solutions within the Plutonium Finishing Plant (PFP).

Conditions and Limitations added by AIR 01-802, August 15, 2001.

- 36) Approved activities include the following: Stabilization by precipitation and use of the muffle furnaces; drying of the precipitated plutonium oxide (PuO_2); packaging of the dried PuO_2 for interim storage and disposal of the filtrate from the liquid nitrate solution using existing PFP processes and solidification.

Conditions and Limitations added by AIR 01-802, August 15, 2001.

- 37) The concentration of the nitric acid make up feed solution used in the magnesium hydroxide process cannot exceed 5.0 Molar.

Conditions and Limitations added by AIR 01-802, August 15, 2001.